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Virtual Machining

1- Introduction

Virtual machining systems apply computers and different types of software in manufacturing and production in order to simulate and model the behavior and errors of a real environment in virtual reality systems [1]. This can provide useful means for products to be manufactured without the need of physical testing on the shop floor. As a result, the time and cost of part production can be decreased [2].

2- Applications

- Simulated machining process in virtual environments can be used in terms of machine tools modifying.
- The part is modeled and produced in a computer simulation environment with predicted errors in order to achieve the best accuracy in the produced part [2].
- The system can be used in process planning of machining operations with regards to the desired tolerances of part designing.
- Optimization techniques can be applied to the simulated machining process in order to increase efficiency of parts production [3].
- Finite element method (FEM) can be applied to the simulated machining process in virtual environments in order to analyze stress and strain of the machine tool, workpiece and cutting tool.
- Accuracy of error modeling in prediction of machined surfaces can be analyzed by using the virtual machining systems.
- Time and cost of accurate production can be decreased by applying rules of production process management to the simulated manufacturing process in the virtual environment.
- Efficiency of part manufacturing can be improved by analyzing the production methods.

3- References

1. Soori, M., Arezoo, B. and Habibi, M., 2013. Dimensional and geometrical errors of three-axis CNC milling machines in a virtual machining system. *Computer-Aided Design*, *45*(11), pp.1306-1313.
2. Soori, M., Arezoo, B. and Habibi, M., 2014. Virtual machining considering dimensional, geometrical and tool deflection errors in three-axis CNC milling machines. *Journal of Manufacturing Systems*, *33*(4), pp.498-507.
3. Soori, M., Arezoo, B. and Habibi, M., 2015. Tool deflection error of three-axis CNC milling machines, monitoring and minimizing by a virtual machining system. *ASME, Journal of Manufacturing Science and Engineering*, *doi:10.1115/1.4032393.*